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McDONNELL Aircraft Corporation

Lambert-Saint Louis MUNICIPAL AIRPORT • BOX 516, ST. LOUIS 66, MO.

13 May 1959
Ref: AEC-551-957

Mr. Robert E. Brinkman
Isotopes Branch
Division of Licensing and Regulation
United States Atomic Energy Commission
Washington 25, D. C.

Dear Sir:

In reply to your letter, reference DLR/IB:REB (13463), the following information is submitted:

1. The Isotope Committee at McDonnell Aircraft Corporation is composed of the following named persons:

William L. Kester	(Chairman)	Research Department
C. George Young	(Alternate)	Research Department
E. V. Sisul		Industrial Hygiene
T. C. Linck	(Alternate)	Industrial Hygiene
J. A. Maloney		General Engineering
G. C. Lengas	(Alternate)	General Engineering
H. E. Christensen		Engineering Methods
H. K. Weber	(Alternate)	Engineering Methods
O. F. Everson		Purchasing
James G. Harris		Inspection
F. C. McCallister, Jr.	(Alternate)	Inspection
N. A. Lamb		Quality Control

With the exception of W. L. Kester and T. C. Link, all persons on the Isotope Committee have completed a two weeks training course in the principles and practices of handling and using radioactive materials. This course, presented by personnel from Nuclear Consultants, Inc., St. Louis, Missouri, served to acquaint these persons with the use of radioactive materials so that they might better -

a) find new uses and applications for radioisotopes,

b) recognize unsafe practices involving the use of these materials, and

c) understand the laws regulating use of licensed material.

At present, the use of radioactive materials is restricted to those persons who have satisfactorily demonstrated their ability to use such materials safely. They are allowed to handle radioisotopes only in quantities consistent with their training. The qualified persons are:

Person	Qualification
James Harris F. C. McCallister, Jr.	Use of sealed Ir-192 as radiography source.
N. A. Lamb	Use of sealed Cs-137 sources in loading bucking bars, inspection and testing newly purchased sources, decontamination of tools and work areas.
H. K. Weber	Direction of program of encapsulation of Cs-137 into bucking bars.
H. E. Winn	Loading Cs-137 into bucking bars.
W. L. Kester	General use of radioactive materials.

The training resume's of G. C. Lengas, H. K. Weber, T. C. Linck, and W. E. Winn are enclosed.

J. H. Schulz is no longer associated with the program.

2. Cobalt-60 sealed sources will be purchased from Oak Ridge National Laboratory as 1/8" by 1/8" pieces in aluminum holders shown in the Radioisotope Catalogue and Price List, Revised 1-57. The cobalt will be contained in holder ORNL-LR-DWG 2333 shown on page 157 of this catalogue.

3. The request for " two curie cobalt-60 sources" is changed to "one curie cobalt-60 sources in accordance with recommendations of your office. The sources will be stored in Tracerlab E15A lead storage containers which in turn will be kept in underground vaults. These vaults are buried five feet underground and have one foot thick concrete plugs placed over the stored material. A 1/4" steel door equipped with a padlock covers the vault. The radiation from one curie cobalt-60 can be reduced to less than 2 mr/hr by placing several plugs over the source.

Sources are to be transported in Tracerlab container E-31B.

Procedures for use of these sources is outlined in Safe Practice Procedure titled, "Handling High Intensity Sources" in the M.A.C. Radioisotope Manual.

4. Delete Iodine-131 from the request.

5. Delete Ra-226 from the request.

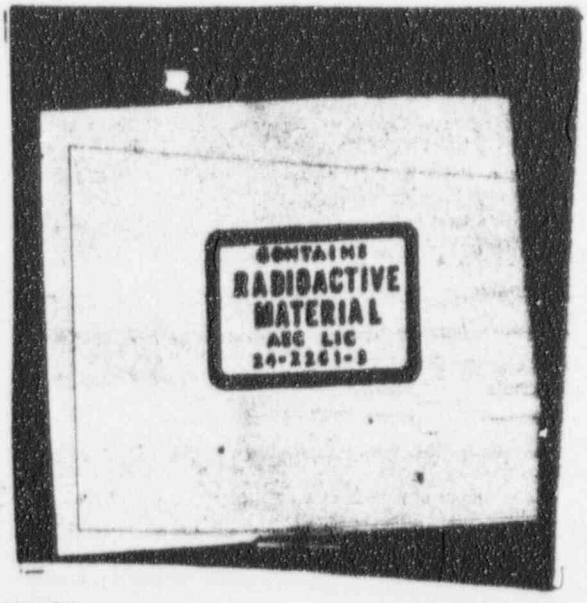
6. While the content of the M.A.C. Safe Practice Procedures has not been arranged into the formal style required for publication and incorporation into the company Control Procedures, the context of these regulations has been finalized. Copies of these regulations are enclosed.

7. The new low levels of radiation exposure have been adopted in accordance with the proposed Commission amendment to 10 CFR Part 20. These changes have been incorporated into the M.A.C. Safe Practice Procedures.

8. Approximately 300 "safety pins" used to prevent the accidental firing of ejection seats installed in aircraft are to be tagged with sealed sources containing four microcuries of Cs-137. These pins are inserted in the firing mechanism of the ejection seat in order to prevent workers from inadvertently triggering the system while the aircraft is on the assembly line. Since these safeties would also prevent the ejection of the seat by the pilot should an emergency arise, it is of utmost importance that they be removed prior to the initial test flight. With regard to tagged tools, we wish to state that the only tools M.A.C. might wish to tag, other than bucking bars, are items such as these safety pins. It is realized that indiscriminate tagging of hand tools such as pliers and screwdrivers would soon result in impossibly high levels within the plant.

9. M.A.C. possesses approximately 10,000 bucking bars each of which contains up to eight microcuries of Cs-137. In general, sufficient sealed sources are imbedded in a bar to produce a surface radiation level of 2 mr/hr.

The cesium is purchased from Nuclear Consultants, Inc., as a sealed source. The bucking bars are tagged by a process in which a hole previously drilled into a non-working face of the tool has a cesium containing capsule inserted into it, then the opening is sealed by welding. The bar with its now doubly sealed source is next marked by welding onto it a steel plate containing a stamped, uncolored radiation symbol. In addition, a decal containing the legend:



is affixed to the bar. These decals which have a yellow background with a magenta border and lettering have been found to withstand the vigorous handling received in the manufacture of aircraft. Because of the expense and time required to mark tools with these decals, it is requested that license number 24-2261-3 presently issued to McDonnell Aircraft Corporation and consequently appearing on these labels be retained in future modifications of this license. Should this not be possible please contact us as soon as possible in order that we may halt our procurement of decals.

10. The following description of the accounting of tagged bucking bars is given in order that the problems associated with the large numbers of these tools might better be understood. Newly purchased, unmarked bars are transferred to the Manufacturing Division where they are loaded by Mr. H. E. Winn. After loading, tagging with radiation symbols, and inspection, each bar is assigned a special number which not only is used for accounting but also identifies it as being radioactive. It is then sent to the tool crib where it is stored until needed. Records of withdrawal and receipt of these tools are kept on form M.A.C. 1372A, one of which is enclosed. A bucking bar, once it is issued to a worker remains in his possession until such time as he returns it for replacement or until he is either transferred to another job or leaves the company. Any attempt to recall these tagged bars, either singly or in groups would so disrupt the manufacturing department's operation as to make this sort of inventory impractical.

Tools can be lost unintentionally by being discarded into scrap piles or through delivery with a product. It is this latter type of loss that the program is designed to minimize. Actually, most unaccounted-for bars have been misplaced in the factory proper. In the past, surveys have shown them to be in boxes or together with other tools, on overhead ledges or dropped behind posts. Efforts are continually being made to recover such items; however, since so many tools are in use it is estimated that about 10% of them are misplaced somewhere in the plant at any one time. This uncertainty as to location of tools makes an accounting of them very difficult if not impossible. The low level of radiation from these devices certainly does not constitute a health hazard.

11. In view of the proposed studies into the factors influencing the wear of cutting tools we request authorization to receive, possess and use any material as irradiated metal samples having atomic number between three and eighty-three inclusive. The request is made in this manner since it is impossible to foretell which elements will be encountered as the program develops. The initial tests are planned for tools made of alloys containing cobalt and tungsten, however, many other combinations are in use and may be of interest.

In addition, we request a possession limit of 1 curie of total activity with a maximum of 50 millicuries for any one piece. This request is made in order that we might irradiate several tools at one time; still no more than one tool will be used at any time.

A resume' of the proposed tool wear study is given:

Tool bits will be irradiated in groups of four in the reactor facilities at the Brookhaven National Laboratory. These activated tools, each of which may contain up to 100 millicuries of active materials (1) will be used in studying the various factors that influence the wear of cutting tools.

Upon receipt of irradiated materials from Brookhaven, the unopened packages will be delivered directly to the radioisotope laboratory where they will be opened. A survey will be made in order to determine whether or not loose contamination is present on either the packing or the irradiated tools.

If the tools are found to be free of loose activity they will be placed in the storage vault until needed. If the tools are contaminated, they will be washed with an organic solvent then with warm water and detergent until wipe tests indicate the absence of contamination. At this time the tools will be stored in the vault until needed.

In order to perform a test, a tool will be removed from the vault with the aid of extension tongs and carried to a milling machine set up especially for these tests.

The machine, a horizontal mill, is located in a fenced-off area near the radioisotope laboratory. This fenced area consists of a wire mesh room surrounding the milling machine completely. Admittance to the area is through a door fitted with a padlock which can be opened only by personnel from the radioisotope laboratory. The cutting head of the machine is completely encased in a sheet steel and lead box which protects the operator from both direct radiation and radioactive chips or spray that may result from the cutting operation. The faces of the shield are constructed so that additional lead sheet can be added in order to increase the shielding should this be necessary. In order to remove metal chips from the oil used to lubricate and cool the cutting surfaces it is passed through filters at the bottom of the shield. It then flows to a sump in the bottom of the machine and is returned to the cutting tool. Whenever active materials are in use, a monitor from Health Physics will be present. He will:

(1) determine the activity levels outside the fenced area

(2) post appropriate radiation warning signs

(3) monitor all operations during the test

(4) survey the area for contamination at the conclusion of the tests

After use, the radioactive tool will be removed from the milling machine and returned to the radioisotope labroatory where it will be cleaned then stored in the vaults until needed again. All chips from the cutting operation will be taken to the radioisotope laboratory for assay.

After use, worn-out tools and chips will be placed in shielded "Dry Active Waste" containers. When either the volume or activity becomes excessive, the Dry Active Waste will be shipped to Oak Ridge, Tennessee for disposal. Similarly, cutting oil and solvents will be collected in shielded polyethylene bottles until such time as the volume or activity become excessive. At this time it will be forwarded to Oak Ridge, Tennessee for disposal.

All operations involving radioactive materials in amounts great enouch to constitute a hazard to personnel will be preceded by dry runs until procedures that will minimize danger of excessive exposure to personnel have been evolved.

Yours very truly,

W. L. Kester
Associate Scientist
Nuclear Applications

WLK:bm

AEC-551-957
Enclosure (1)

The tool bits to be used initially in these studies are made from an alloy consisting of 8.5% cobalt, 72% tungsten, 11.5% tantalum, and 8% titanium.

Calculations show that activation of these tools in a thermal flux will yield a ratio of approximately one millicurie of beta activity for each millicurie of hard gamma; that is, gamma greater than 1 mev. If we activate a tool to a total activity of 50 millicuries, we then have 25 millicuries of gamma against which we must provide shielding. Taking an average energy of 1.2 mev, this would yield 150-160 mr at one foot. This radiation level is certainly not too difficult to handle if one uses 3' extension tongs and 1" - 2" thick lead shielding.

George C. Lengas

Type of Training	Where Trained	Duration	On Job	Formal Course
a.	Oak Ridge School of Nuclear Studies	1 mo.	yes	yes
b.	Nuclear Consultants Inc.	2 wks	yes	yes
c.	Washington University	2 yrs	yes	yes
d.	McDonnell Aircraft Corp.		yes	yes

Isotope	Max. Amount	Where	Duration	Use
Cs-137	400 uc	McDonnell Aircraft	1½ yrs	Inspection of sources
Fission Prod.	4 uc	ORINS	1 mo.	Training

T. C. Linck

Type	Where Trained	Duration	On Job	Formal Course
a.	Univ. of W. Virginia	2 yrs	yes	yes
b.	School of Industrial Hygiene, Cincinnati	1 mo.	yes	yes
c.	McDonnell Aircraft Corporation		yes	yes
d.		6 mo.	yes	yes

Isotope	Max. Amount	Where Trained	Duration	Use
Cs-137	400 uc	McDonnell Aircraft	6 mo.	Inspection of sources

H. K. Weber

H. E. Winn

Both were trained at McDonnell Aircraft Corporation in the use of microcurie amounts of Cs-137 as sealed sources. They are concerned solely with loading sealed sources into bucking bars and never handle radioactive material in amounts greater than 40 microcuries.

Form AEC-313 (5-58)

ATOMIC ENERGY COMMISSION

APPLICATION FOR BYPRODUCT MATERIAL LICENSE

Form approved. Budget Bureau No. 38-R027.3.

INSTRUCTIONS.--Complete items 1 through 16 if this is an initial application. If application is for renewal of a license, complete only items 1 through 7 and indicate new information or changes in the program as requested in items 8 through 15. Use supplemental sheets where necessary. Item 16 must be completed on all applications. Mail three copies to: U. S. Atomic Energy Commission, Washington 25, D. C. Attention: Isotopes Branch, Division of Licensing and Regulation. Upon approval of this application, the applicant will receive an AEC Byproduct Material License. An AEC Byproduct Material License is issued in accordance with the general requirements contained in Title 10, Code of Federal Regulations, Part 30 and the Licensee is subject to Title 10, Code of Federal Regulations, Part 20.

1. (a) NAME AND STREET ADDRESS OF APPLICANT. *(Institution, firm, hospital, person, etc.)*

McDonnell Aircraft Corporation
P. O. Box 516
St. Louis, Missouri

(b) STREET ADDRESS(ES) AT WHICH BYPRODUCT MATERIAL WILL BE USED. *(If different from 1 (a).)*

same

2. DEPARTMENT TO USE BYPRODUCT MATERIAL

General Engineering Department
Research Department

3. PREVIOUS LICENSE NUMBER(S). *(If this is an application for renewal of a license, please indicate and give number.)*

24-2261-3

4. INDIVIDUAL USER(S). *(Name and title of individual(s) who will use or directly supervise use of byproduct material. Give training and experience in Items 8 and 9.)*

W. L. Kester, Associate Scientist
Nuclear Applications
G. C. Lengas Associate Engineer

5. RADIATION PROTECTION OFFICER *(Name of person designated as radiation protection officer if other than individual user. Attach resume of his training and experience as in Items 8 and 9.)*

Same as original application

6. (a) BYPRODUCT MATERIAL. *(Elements and mass number of each.)*

Any element between 3 and 83 inclusive

(b) CHEMICAL AND/OR PHYSICAL FORM AND MAXIMUM NUMBER OF MILLICURIES OF EACH CHEMICAL AND/OR PHYSICAL FORM THAT YOU WILL POSSESS AT ANY ONE TIME. *(If sealed source(s), also state name of manufacturer, model number, number of sources and maximum activity per source.)*

As irradiated metal bits - with a maximum of 50 millicuries each and a total of 1 curies.

7. DESCRIBE PURPOSE FOR WHICH BYPRODUCT MATERIAL WILL BE USED. *(If byproduct material is for "human use," supplement A (Form AEC-313a) must be completed in lieu of this item. If byproduct material is in the form of a sealed source, include the make and model number of the storage container and/or device in which the source will be stored and/or used.)*

Machine - Tool wear studies

18915

(Continued on reverse side)

Form AEC–313 (5-58) Page Two

TRAINING AND EXPERIENCE OF EACH INDIVIDUAL NAMED IN ITEM 4 *(Use supplemental sheets if necessary)*

8. TYPE OF TRAINING	WHERE TRAINED	DURATION OF TRAINING	ON THE JOB (Circle answer)	FORMAL COURSE (Circle answer)
a. Principles and practices of radiation protection			Yes No	Yes No
b. Radioactivity measurement standardization and monitoring techniques and instruments	See original application and enclosure.		Yes No	Yes No
c. Mathematics and calculations basic to the use and measurement of radioactivity			Yes No	Yes No
d. Biological effects of radiation			Yes No	Yes No

9. EXPERIENCE WITH RADIATION. *(Actual use of radioisotopes or equivalent experience.)*

ISOTOPE	MAXIMUM AMOUNT	WHERE EXPERIENCE WAS GAINED	DURATION OF EXPERIENCE	TYPE OF USE

10. RADIATION DETECTION INSTRUMENTS. *(Use supplemental sheets if necessary.)*

TYPE OF INSTRUMENTS *(Include make and model number of each)*	NUMBER AVAILABLE	RADIATION DETECTED	SENSITIVITY RANGE *(mr/hr)*	WINDOW THICKNESS *(mg/cm²)*	USE *(Monitoring, surveying, measuring)*

11. METHOD, FREQUENCY, AND STANDARDS USED IN CALIBRATING INSTRUMENTS LISTED ABOVE.

12. FILM BADGES, DOSIMETERS, AND BIO-ASSAY PROCEDURES USED. *(For film badges, specify method of calibrating and processing, or name of supplier.)*

INFORMATION TO BE SUBMITTED ON ADDITIONAL SHEETS

13. FACILITIES AND EQUIPMENT. Describe laboratory facilities and remote handling equipment, storage containers, shielding, fume hoods, etc. Explanatory sketch of facility is attached. *(Circle answer)* Yes No

14. RADIATION PROTECTION PROGRAM. Describe the radiation protection program including control measures. If application covers sealed sources, submit leak testing procedures where applicable, name, training, and experience of person to perform leak tests, and arrangements for performing initial radiation survey, servicing, maintenance and repair of the source.

15. WASTE DISPOSAL. If a commercial waste disposal service is employed, specify name of company. Otherwise, submit detailed description of methods which will be used for disposing of radioactive wastes and estimates of the type and amount of activity involved.

CERTIFICATE (This item must be completed by applicant)

16. THE APPLICANT AND ANY OFFICIAL EXECUTING THIS CERTIFICATE ON BEHALF OF THE APPLICANT NAMED IN ITEM 1, CERTIFY THAT THIS APPLICATION IS PREPARED IN CONFORMITY WITH TITLE 10, CODE OF FEDERAL REGULATIONS, PART 30, AND THAT ALL INFORMATION CONTAINED HEREIN, INCLUDING ANY SUPPLEMENTS ATTACHED HERETO, IS TRUE AND CORRECT TO THE BEST OF OUR KNOWLEDGE AND BELIEF.

RECEIVED MAY 22 1959 U.S.A.E.C. Isotopes Branch Div. of L & T

Applicant named in item 1

Date _____ By _____

Title of certifying official

WARNING.—18 U. S. C., Section 1001; Act of June 25, 1948; 62 Stat. 749, makes it a criminal offense to make a willfully false statement or representation to any department or agency of the United States as to any matter within its jurisdiction.

U. S. GOVERNMENT PRINTING OFFICE : 1958 O—491088

24-2261-3

OFFICE VISIT BY: Mr. William L. Kester
McDonnell Aircraft Corporation
St. Louis, Missouri

REBrinkman:mog
April 30, 1959

TO: R. E. Brinkman, J. R. Mason
and G. L. Hutton

Mr. Kester visited the Isotopes Branch to discuss his recent request for relief from accountability of bucking bars tagged with Cesium 137.

It was explained to Mr. Kester that he could not be granted exception from the regulatory requirements for accountability with the latitude indicated by his letter. After discussing the matter further, it was determined that what he should do is to write us a letter explaining in full the present system of accountability and acknowledging the points at which it breaks down. He does maintain accountability for receipt of the small sources used for tagging and for the issuance of the tagged bucking bars to workers. There have been some 10,000 bucking bars treated in this fashion. His position is that he cannot possibly physically recover these 10,000 bars without some turning up missing. It was explained that after this position was on the record and accepted by this office, he would be covered.

It was also pointed out that he may need an exception to 10-CFR-20 to provide for the lack of the proper colors in the radiation symbol used in labeling these bucking bars.